

REMARKS

This Amendment serves as the submission accompanying Applicants' Request for Continued Examination (RCE) filed pursuant to 37 C.F.R. §1.114. By final Office Action mailed September 10, 2007, all pending claims stand rejected, reconsideration of which is respectfully requested in view of the above amendments and following remarks.

Status of Claims

In response to a prior Restriction Requirement, Applicants elected claims 1-14 for continued prosecution on the merits. Accordingly, claims 15-34 have been canceled as directed to non-elected subject matter, and Applicants reserve the right to continue prosecution of the same in one or more divisional applications.

In addition to the prior restriction requirement, Applicants also elected the species of claim 4 for purpose of initial examination (*i.e.*, wherein the barrier film is impregnated into the fluid diffusion layer). In view of this species election, the Examiner has withdrawn claims 2 and 3 from consideration at the present time. To the extent the Examiner finds claim 1 allowable (claim 1 being generic to claim 4, as well as claims 2 and 3), Applicants request that claims 2 and 3 be rejoined.

Rejections of Claims 1 and 4-14

For the reasons noted in the final Office Action at pages 2 through 4, claims 1, 4-6, 8 and 10-14 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. Patent Publication 2001/0001052 to Bonk et al. ("Bonk"), while claims 7 and 9 stand rejected under 35 U.S.C. 103(a) as obvious over Bonk in view of U.S. Patent Publication 2005/0014059 to Kaye ("Kaye"). By these rejections, the Examiner has carried forward the text originally set forth in prior office actions. However, on page 5 of the final Office Action, under the heading "Response to Arguments", the Examiner has specifically commented on Applicants' prior arguments in favor of patentability. Accordingly, the following remarks will focus on the comments made by the Examiner on page 5 of the final Office Action.

In brief, the Examiner's opinion of unpatentability rests upon two distinct arguments. The first has to do with the nature of the seal disclosed by Bonk, while the second relates to its location along the sealing region. Applicants will address each of these rejections separately below.

No Single Element Disclosed in Bonk Inherently Anticipates Both the Seal and a Barrier Film Recited in Pending Claim 1

Claim 1 recites a membrane electrode assembly for an electrochemical fuel cell comprising, *inter alia*, (1) a fluid impermeable integral seal impregnated into the fluid diffusion layers in sealing regions thereof; and (2) a barrier film interposed between the ion-exchange membrane and the fluid impermeable integral seals, with the proviso that barrier film is more chemically stable to acid hydrolysis than the integral seal.

It has been discovered that use of both an integral seal and a barrier film (which separates the sealant from the electrochemical reaction and/or the ion exchange member) reduces or eliminates contamination from sealant materials commonly utilized in the membrane electrode assembly (MEA) of electrochemical fuel cells. As disclosed in the specification as originally filed, membrane contamination represents a serious problem that can significantly reduce the lifetime of a polymer electrolyte membrane (PEM) fuel cell. More specifically, it has been found that sealant impregnated in the edge of the electrode layer may degrade, such that contaminants from the sealant then migrate to the membrane (*see* specification at page 3, lines 15-17). As recited in the pending claims, this problem is addressed by separating the sealant in the electrode from the electrochemical reaction taking place in the catalyst layer by way of a barrier film.

In the final Office Action at page 5, the Examiner has rejected Applicants' position on this issue, stating:

Applicant argues that Bonk does not teach a barrier film, but that the component of Bonk that the examiner has recognized as a barrier film is in fact a seal. While Bonk may call it a seal, it is the same material in the same position as the instant invention; therefore, it is inherently a barrier film. Additionally, a component that functions as a barrier would inherently seal, and vice versa. If a component is a barrier, then it is

preventing the contamination of something on one side by something on the other side.
A seal serves the same purpose.

Applicants respectfully disagree. Claim 1 recites (1) a fluid impermeable integral seal and (2) a barrier film that is more chemically stable to acid hydrolysis than the integral seal. For Bonk to anticipate this aspect of claim 1, it must disclose two elements; namely, a first element (*i.e.*, an integral seal) and a second element that is more stable than the first element (*i.e.*, a barrier film). A single element cannot inherently function as two elements in this regard since the two elements possess different functional attributes (*i.e.*, the second element is more chemically stable than the first element).

Stated differently, anode and cathode substrate edge seals 36 and 52 as depicted in Figure 2 of Bonk cannot serve as both (1) the integral seal and (2) the barrier film as recited in pending claim 1. Similarly, thermoplastic material 42 and 46 used to bond and seal various components cannot serve as both (1) the barrier film and (2) the integral seal as recited in pending claim 1. Instead, and due to the different functional attributes recited (*i.e.* that the barrier film is more chemically stable than the integral seal), two different elements must be disclosed to sustain a proper rejection in this regard.

As noted in the MPEP, for a missing element to be established by inherency, it must be clear from the art cited that the missing element is necessarily present in the prior art (*see* MPEP §2112, Eighth Edition, Rev. 6, Sept. 2007). Such a showing has not been made, especially since the two elements at issue have different functional attributes. *See In re Robertson*, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (The claims were drawn to a disposable diaper having three fastening elements, while the prior art reference disclosed two fastening elements. Court reversed the holding of the BPAI that claims were inherently anticipated, finding instead that third fastening means was separate from and in addition to the other mechanical fastening means and performed a different function.).

Accordingly, Applicants respectfully request that the rejection of the pending claims based on inherency be withdrawn. Instead, and assuming that the Examiner relies on Bonk for what it explicitly teaches, Applicants assume that the Examiner considers thermoplastic materials 42 and 46 (*see* Figure 2 of Bonk) to constitute the barrier film, and substrate seals 36

and 52 (*see* Figure 2 of Bonk) to constitute the fluid impermeable integral seals, as both elements are currently recited in pending claim 1. The remainder of Applicants' remarks will be based on this understanding of the Examiner's position.¹

Bonk Does Not Disclose the Recited Location of the Barrier Film

In addition to reciting a membrane electrode assembly for an electrochemical fuel cell comprising, *inter alia*, (1) a fluid impermeable integral seal and (2) a barrier film that is more chemically stable to acid hydrolysis than the integral seal, claim 1 further recites (3) that the barrier film is interposed between the ion-exchange membrane and the fluid impermeable integral seals along at least a portion of the sealing region of at least one of the fluid diffusion layers.

In the final Office Action at page 5, the Examiner commented on the location of the barrier film as follows:

Next, Applicant argues that that barrier films of Bonk are "not interposed between the ion-exchange membrane and the fluid impermeable integral seals along at least a portion of the sealing region of at least one fluid diffusion layers" (page 6 of Remarks). The examiner disagrees. Bonk teaches that the substrate seal impregnates the cathode and anode substrates ([0042]). In order for impregnation to occur, diffusion between the two materials would inherently occur. The seam between the substrate seal and the cathode surface would have a certain thickness, extending into the body of the substrate as well as the body of the seal. The barrier film, therefore, would inherently cover at least a portion of the sealing region. (*emphasis in original*)

In order to further clarify the location of the barrier film, Applicant have amended claim 1 to recite that the barrier film extends beyond the sealing region in the direction towards the reactive area of the ion-exchange membrane. This aspect of the invention is discussed in the specification as originally filed at page 9, lines 4-13, and depicted in the figures. For example, referring to Figure 3a, barrier film 60 extends beyond sealant region 45 (*i.e.*, barrier film 60 extends to the left of sealant region 45, which is in the direction of the reactive area of the ion-exchange membrane).

¹ If Applicants' understanding of the Examiner's reliance on Bonk is incorrect, the Examiner is respectfully requested to contact the undersigned to clarify the Examiner's reliance on the same in support of the outstanding lack of novelty rejection.

Referring to Figure 2 of Bonk, and assuming that the Examiner considers thermoplastic materials 42 and 46 to constitute the barrier film, such materials do not extend beyond the edge of substrate seals 36 and 52. Instead, thermoplastic materials 42 and 46 only extend to the edge of substrate seals 36 and 52. In view of the Examiner's comments quoted above, the Examiner is of the opinion that substrate seals 36 and 52 of Bonk impregnate anode and cathode substrates 34 and 32, respectively, and thus the substrate seal extends into the body of the substrate itself (*i.e.*, extending the body of the seal beyond the left edge of substrate seals 36 and 52 depicted in Figure 2 of Bonk). In this instance, the thermoplastic material depicted in Figure 2 of Bonk would not even extend to the edge of the substrate seal. Instead, the substrate seal would extend beyond the edge of the thermoplastic material (due to diffusion into substrates 34 and 32), thereby placing the substrate sealant adjacent to the ion-exchange membrane.

As noted previously, it has been discovered that separating the sealant from the electrochemical reaction and/or the ion exchange member reduces or eliminates contamination from sealant contaminants commonly utilized in the MEA of electrochemical fuel cells, and degradation of sealant impregnated in the edge of the electrode layer represents a serious problem that can significantly reduce the lifetime of a PEM fuel cell. However, practicing Bonk in the manner asserted by the Examiner results in sealant adjacent the PEM, at least in the area described by the Examiner as the diffusion seam between the substrate and the seal.

Claim 1 has been amended to recite that the barrier film extends beyond the sealing region in the direction towards the reactive area of the ion-exchange membrane (*i.e.*, it extends at least to the edge of any diffusion seam between the substrate and the seal). In this manner, reactive species are less likely to migrate to the sealant and/or sealant contaminants are less likely to migrate to the membrane. This feature is clearly not disclosed by Bonk.

Accordingly, Applicants respectfully submit that claim 1, as amended herein, is not anticipated by the disclosure of Bonk. Further, since claims 2-14 depend directly or indirectly from claim 1, and thus contain all the limitations thereof, they are novel over the disclosure of Bonk for the same reasons.

The Pending Claims are Not Obvious Over Bonk and/or Kaye

For the reasons noted above, Applicants submit that the pending claims are not taught (explicitly or inherently) by Bonk. Further, Bonk does not suggest or motivate one skilled in this field to arrive at the claimed invention. In short, Bonk is directed to a method for bonding fuel cell components to one another, as well as sealing of the fuel cell stack. There is absolutely no evidence that Bonk even recognized the problem of contaminants from the sealant migrating to the membrane, let alone proposes a solution to this problem. Accordingly, Bonk cannot fairly be used to support an obviousness rejection of the pending claims (and, in fairness to the Examiner, has not been relied upon by the Examiner in this manner).

The addition of Kaye does not cure the deficiencies of Bonk discussed herein. While Kaye discloses a peripheral gasket or seal, this reference does not teach or suggest an integral seal and barrier film as recited in the pending claims, particularly the location of the barrier film in relation to the sealing regions resulting from impregnation of the integral seal into the fluid diffusion layers.

Accordingly, neither Bonk nor Kaye, taken alone or in any combination, render claim 1 obvious. Since claims 2-14 depend directly or indirectly from claim 1, and thus contain all the limitations thereof, they are patentable over Bonk and/or Kaye for the same reasons.

Rejoinder of Claims 2 and 3

Claim 1 is generic to claims 2 and 3, and should the Examiner find claim 1 to be patentable over the cited prior art for the reasons noted above, Applicants request that withdrawn claims 2 and 3 be rejoined at this time and also passed to allowance.

Conclusion

In view of the above remarks, consideration and allowance of claims 1-14 is respectfully requested. A good faith effort has been made to place this application in condition for allowance. However, should any further issue require attention prior to allowance, the Examiner is requested to contact the undersigned at (206) 622-4900 to resolve the same.

Respectfully submitted,
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